Euselasia mys lara (Stichel, 1919)(Lepidoptera: Riodinidae) a potential pest on *Eucalyptus* in Brazil?

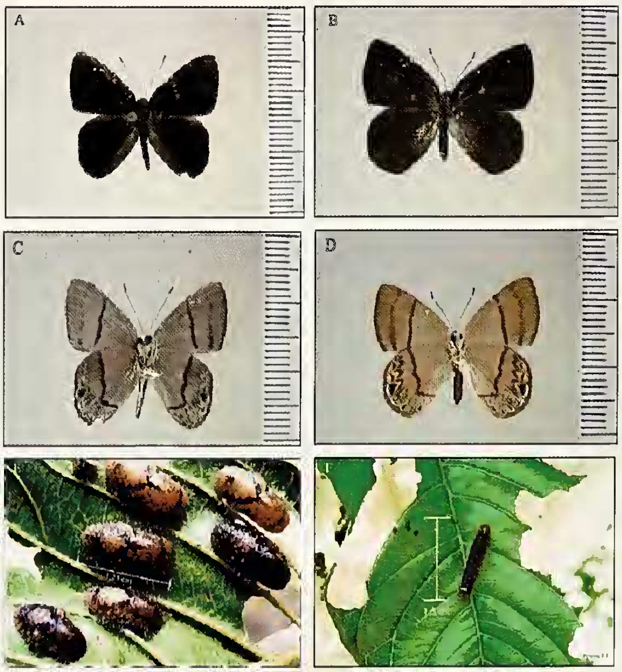
Eucalyptus species have been used across large areas of reforestation in Brazil over the past 40 years (Zanuncio *et al.*, 1990). High yield from these reforestations result from widespread use of clones (Laranjeiro, 1994; Zanuncio *et al.*, 2001), but the genetic uniformity among clones increases vulnerability to insect pests (Zanuncio *et al.*, 2003). All the *Eucalyptus* leaf eating Lepidoptera in Brazil are native species generally using Myrtaceae (Holtz *et al.*, 2003a). The adaptation of native insects to *Eucalyptus* have been reported elsewhere: China, India, New Guinea and Sumatra (Ohmart & Edwards, 1991). In Brazil *Eupseudosoma aberrans* (Schaus, 1905) and *Eupseudosoma involuta* (Sepp, 1855) (Lepidoptera: Arctiidae), *Automeris sp.* (Walker) and *Eacles imperiales* (Walker, 1856) (Lepidoptera: Saturniidae), *Sabulodes caberata* (Guenée, 1857), *Thyrinteina arnobia* (Stoll, 1782) and *Oxydia vesulia* (Cramer, 1779) (Lepidoptera: Geometridae) are examples of insect adapting to *Eucalyptus* crops (Zanuncio *et al.*, 1998). *Mimallo amilia* (Cramer, 1780) (Lepidoptera: Mimallonidae), originally a pest of *Myrciaria dubia* in the Amazon region (Zanuncio *et al.*, 2005), has been reported as a secondary pest of *Eucalyptus urophylla* in the region of Três Marias, Minas Gerais State, Brazil (Pereira *et al.*, 2001).

The genus *Euselasia* is distributed throughout the tropical region where it has great diversity, exemplified by 167 species named to date from Mexico to Bolivia, Argentina and Uruguay (Callaghan & Lamas, 2004), with 24 species found at one site in Ecuador (Murray, 2000). In Brazil, caterpillars of the *Euselasia* genus have been reported on *Pisidium araça, Psidium guajava, Eugenia pitanga, Eugenia uniflora* and *Eucalyptus spp.* (Silva *et al.*, 1968). *Euselasia eucerus* (Hewitson, 1872) (erroneously reported as *Euselasia apisaon*) damaged 20.000 hectares of *Eucalyptus* forests in the Vale do Rio Doce and mining áreas in Minas Gerais State, Brazil (Moraes *et al.*, 1983). *Euselasia eucerus* (*Euselasia apisaon*) was found on *Eucalyptus cloeziana* plantations in the region of São Pedro dos Ferros, Minas Gerais State, Brazil (Zanuncio *et al.*, 1990). Eggs of *Euselasia hygenius* (Stoll, 1790) were collected on *Eucalyptus urophylla* reforestations in the municipality of Aracruz, Espírito Santo State, Brazil (Zanuncio *et al.*, 1995).

Numerous larval colonies of a riodinid of all stages were observed from February to May 2006 on guava tree leaves (*Psidium. guajava*) at the Federal University of Viçosa in Viçosa, Minas Gerais State, Brazil. Samples of branches of trees with colonies were wrapped in white organza bags (20 x 30 cm) and the larvae allowed to pupate. The pupae were removed to a laboratory environment where they were maintained at 25 ± 2°C, 70 ± 5% RH with 12 hour L/D. The resultant adults were subsequently determined by Olaf Mielke as *Euselasia mys lara* (Stichel, 1919). Both sexes of adults are given in figures 1 to 4.

The larvae are gregarious, moving about in single lines and remaining on the abaxial leaf surface or walking on stems, leaves and branches of the guava tree when they are not feeding. During the first instar the larvae feed only on the leaf surfaces. The later instars consume entire leaves. The cephalic capsule is pale yellow and the body dark gray and with six longitudinal white stripes, four dorsal and two ventral. In the last instar they have pale yellow setae. Pupation occurs most frequently on the abaxial surface of leaves. The pupae are pale yellow with brown spots and many pale yellow hairs and do not display sexual

Figure 1. *Euselasia mys lara* (Lepidoptera: Riodinidae). Dorsal view of adult male (A); Dorsal view of adult female (B); ventral view of adult male (C); ventral view of adult female (D); pupa, bar= 1,25 cm (E) and caterpillar in the last stage, bar= 1,5 cm (F).



dimorphism.

On the other hand, *E. mys lara* adults show strong sexual dimorphism with the upperside of both wings of males being black with dark red spots that start close to the thorax and radiate to the wing edge. These spots are absent in females. The underside of the wings of both sexes are pale gray in color with 0.01 cm wide pale orange stripes that start from the anterior and continue to the posterior of the wings. The secondary wings have five black spots surrounded by white halos. The wings of the males of the species average a 3.0 cm wingspan and the females 2.6 cm. The head of both sexes present a white `V´ when viewed from the front, the abdomen is dorsally black and pale gray ventrally.

This is the first report of *E. mys lara* feeding upon guava, with the species not previously reported on any Myrtaceae, including *Eucalyptus*. Larvae of *E. mys lara* differ from those of *E. eucerus* (*E. apisaon*) in the latter having a last instar with a black head capsule, green coloring and pale setae on the legs (Zanuncio *et al.*, 1990). The related *E. hygenius* larvae has segments with two yellow dorsal spots, from which tufts of green setae arise. They also have three longitudinal stripes, one dorsal and two ventral (Zanuncio *et al.*, 1995). Pupae of *E. mys lara* also differ from those of *E. hygenius* that are a uniform yellow color, while those of *E. eucerus* (*E. apisaon*) are gray brown without hairs (Zanuncio *et al.*, 1990; Zanuncio *et al.*, 1995).

E. eucerus adults (*E. apisaon*) also showed sexual dimorphism: the male upperside wings are brick red colored with dark edges, the females being dark gray with some variants having three pair of white round spots in the middle of the primaries (Zanuncio *et al.*, 1990). By contrast, *E. hygenius* does not display sexual dimorphism, with upperside wings black in both sexes (Zanuncio *et al.*, 1995). These characters clearly distinguish the three species in both early stages and adults.

The abundance of species of the *Euselasia* genus in Brazil and reports of *E. eucerus* and *E. hygenius* feeding upon *Eucalyptus* implies that other species of the genus may damage plantations as a result of adaptive pressures across extensive reforestation areas of Brazil (Holtz *et al.*, 2003b). This has occurred with other Lepidoptera, including *Thyrinteina arnobia* (Lepidoptera: Geometridae), considered the main leaf eating larva of *Eucalyptus* in Brazil (Cavalcante *et al.*, 2000; Santos *et al.*, 2000; Holtz *et al.*, 2003a; Oliveira *et al.*, 2005). Accordingly *E. mys lara* should be included in pest monitoring programs for *Eucalyptus* since the butterfly does occur in Minas Gerais State on a phylogenetically similar host, the guava. Additional studies are clearly called for regarding the *E. mys lara* autecology and control methods.

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Literature cited

Callaghan, C. J. & G. L. Lamas. 2004. Riodinidae, pp. 141-170. *In*: Lamas, G. (ed.). Checklist: Part 4A Hesperioidea – Papilionoidea. *In*. Heppner. J. B. (ed.) Atlas of Neotropical Lepidoptera 5A. XXXVI+439 pp. Gainesville, Association of Tropical Lepidoptera.

Cavalcanti, M. G., E. F. Vilela, A. E. Eiras, J. C. Zanuncio & M. C. Picanço. 2000. Interação tritrófica entre *Podisus nigrispinus* (Dallas) (Heteroptera: Pentatomidae), *Eucalyptus* e lagartas de *Thyrinteina arnobia* (Stoll) (Lepidoptera: Geometridae): I Visitação. Anais da Sociedade Entomológica do Brasil 29: 697-703.

Holtz, A. M., H. G. de Oliveira, A. Pallini, M. Venzon, J. C. Zanuncio, C. L. Oliveira, J. S. Marinho & M. C. Rosado. 2003a. Desempenho de *Thyrinteina arnobia* Stoll (Lepidoptera: Geometridae) em eucalipto e goiaba: o hospedeiro nativo não é um bom hospedeiro? Neotropical Entomology 32: 427-431.

Holtz, A. M., J. C. Zanuncio, H. G. de Oliveira, A. Pallini, C. L. Oliveira, J. S. Marinho & T. B. M. Pinon. 2003b. Aspectos biológicos de *Thyrinteina arnobia* Stoll (Lepidoptera: Geometridae) provenientes de lagartas criadas em folhas de *Eucalyptus cloeziana* ou de *Psidium guajava* sob condições de campo. Revista Árvore 27: 897-901.

Laranjeiro, A. J. 1994. Integrated pest management at Aracruz Celulose. Forest Ecology and Management 65: 45–52.

Moraes, G. W. G., P. G. Brun & L. A. Soares. 1983. O controle biológico de lepidópteros desfolhadores e eucaliptos em Minas Gerais. Informe Agropecuário 9: 23-30.

Murray, D. L. 2000. A survey of the butterfly fauna of Jatun Sacha, Ecuador (Lepidoptera: Hesperioidea and Papilionoidea). Journal of Research on the Lepidoptera 35: 42–60.

Ohmart C. P. & P. B. Edwards. 1991. Insect herbivory on *Eucalyptus*. Annual Review of Entomology 36: 637–57.

Oliveira, H. N., J. C. Zanuncio, E. P. Pedruzzi & M. C. Espindula. 2005. Rearing of *Thyrinteina arnobia* (Lepidoptera: Geometridae) on guava and *Eucalyptus* in laboratory. Brazilian Archives of Biology and Technology 48: 801-806.

Pereira, J. M. M., T. V. Zanuncio, J. C. Zanuncio & A. Pallini. 2001. Lepidoptera pests collected in *Eucalyptus urophylla* (Myrtaceae) plantations during five years in Três Marias, State of Minas Gerais, Brazil. Revista de Biologia Tropical 49: 1073-1082.

Santos, G. P., T. V. Zanuncio & J. C. Zanuncio. 2000. Desenvolvimento de *Thyrinteina arnobia* Stoll (Lepidoptera: Geometridae) em folhas de *Eucalyptus urophylla* e *Psidium guajava*. Anais da Sociedade Entomológica do Brasil 29: 13-22.

Silva, A. G. D. A., C. R. Gonçalves, D. M. Galvão, A. J. L. Gonçalves, J. Gomes, M. N. Silva & L. Simoni. 1968. Quarto catálogo dos insetos que vivem nas plantas do Brasil, seus parasitas e predadores 2(1). Rio de Janeiro, Laboratório Central de Patologia Vegetal.

Zanuncio, J. C., J. F. Garcia, G. P. Santos, T. V. Zanuncio & E. C. Nascimento. 1990. Biologia e consumo foliar de lagartas de *Euselasia apisaon* (Dalman, 1823) (Lepidoptera: Riodinidae) em *Eucalyptus spp*. Revista Árvore 14: 45-54.

Zanuncio, T. V., J. C. Zanuncio, J. B. Torres, A. J. Laranjeiro. 1995. Biologia de *Euselasia hygenius* (Lepidoptera, Riodinidae) e seu consumo foliar em *Eucalyptus urophylla*. Revista Brasileira de Entomologia 39: 487-492.

Zanuncio, T. V., J. C. Zanuncio, M. M. M. Miranda & A. G. B. Medeiros. 1998. Effect of plantation age on diversity and population fluctuation of Lepidoptera collected in *Eucalyptus* plantations in Brazil. Forest Ecology and Management 108: 91-98.

Zanuncio, J. C., R. N. C. Guedes, T. V. Zanuncio & A. S. Fabres. 2001. Species richness and abundance of defoliating Lepidoptera associated with *Eucalyptus grandis* in Brazil and their response to plant age. Austral Ecology 26: 582–589.

Zanuncio, J. C., T. V. Zanuncio, F. A. Freitas & D. Pratissoli. 2003. Population density of Lepidoptera in a plantation of *Eucalyptus urophylla* in the state of Minas Gerais, Brazil. Animal Biology. 53: 17-26.

Zanuncio, T. V., J. C. Zanuncio, J. S. Zanuncio Jr., G. P. Santos, M. C. Q. Fialho & A. S. Bernardino. 2005. Aspectos biológicos e morfológicos de *Mimallo amilia* (Lepidoptera: Mimallonidae) em folhas de *Eucalyptus urophylla*. Revista Árvore 29: 321-326.

Marcus Alvarenga Soares, Teresinha Vinha Zanuncio, José Cola Zanuncio,* Departamento de Biologia Animal, Universidade Federal de Viçosa, 36571-000, Viçosa, Minas Gerais State, Brazil.
zanuncio@ufv.br, marcusasoares@yahoo.com.br

Olaf Hermann Hendrik Mielke, Departamento de Zoologia, Universidade Federal do Paraná, 19020, Curitiba, Paraná State, Brazil.
omhesp@ufpr.br

José Eduardo Serrão, Departamento de Biologia Geral, Universidade Federal de Viçosa, 36571-000, Viçosa, Minas Gerais State, Brazil.
jeserrao@ufv.br

**Corresponding author*

Observations of late instar larva survival of *Cotesia* (Hymenoptera: Braconidae) parasitoid attack of *Euphydryas anicia cloudcrofti* (Lepidoptera: Nymphalidae).

Over the course of rearing a population of 100 *Euphydryas anicia cloudcrofti* (Ferris & Holland, 1980) (Lepidoptera: Nymphalidae) in captivity, an interesting observation emerged of a unique parasitoid-host interaction. The parasitoid infecting this population was identified as belonging to the genus *Cotesia* (Hymenoptera: Braconidae). Current molecular studies are under way to determine the exact identity of this parasitoid, which may represent a new species of *Cotesia*.

The first observation of *E. a. cloudcrofti* larvae attacked by a parasitoid came from three wild collected larvae in October of 2006. These larvae were in the third and fourth instars, and all of these larvae died shortly after the *Cotesia* larvae emerged to pupate. In the following spring, three post-diapause larvae (fifth and sixth instars) were able to survive after the *Cotesia* larvae emerged to pupate. These surviving larvae became very lethargic and refused to eat for several days, but then seemed to recover. Two of these larva proceeded to pupate, while the third died before pupation. Of the two larvae that immediately pupated, one emerged as a normal adult and the other displayed wing deformities. The same phenomenon was observed again with wild-caught larvae in 2007 (from a total population of 100 larvae), when the early instars died after parasitoid emergence but a single late instar larva survived the parasitoid attack.

Parasitoids are distinguished from parasites by the very fact that they cause the eventual death of the host (Godfray 1993; Borrer *et al.*, 1981; Ricklefs, 1979), but this observation of *E. a. cloudcrofti* survival, however, along with observations of Arctiid larva (*Platyprepia virginalis* (Boisduval)) surviving *Thelairia bryanti* emergence (English-Loeb *et al.*, 1990), may cause us to reconsider the relationship between parasitoids and parasites with their hosts. Perhaps it would be more appropriate to view this relationship as a continuum with at one end pure parasitoids cause certain host death; while at the other pure parasites cause certain host survival; and intermediate points along the continuum represent less certain host survival outcomes.

Although host survival of parasitoid attack may be rare, the fact that it occurs at all in Lepidoptera is biologically significant because it suggests that specific conditions exist that will permit a host to survive a normally fatal parasitoid attack.

Investigations to define conditions that permit host survival would be warranted. In this case the common feature between the *E. a. cloudcrofti* and *P. virginalis* observations is that they occurred in captive reared populations. It is possible that some condition of artificial rearing better enables a host to survive parasitoid attacks.

It is also quite possible that this phenomenon occurs at such low frequencies in the wild population that it has gone undetected. Ehrlich and Hanski (2004) noted *Cotesia* parasitizing checkerspot butterflies often display specialized behaviors that are not characteristic of their congeners. Host survival may be a result of this specialized *Cotesia* behavior, or it may be the result